**SOURCE CODE**

!pip install tensorflow

!pip install opencv**-**python

!pip install opencv**-**contrib**-**python

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: tensorflow in /usr/local/lib/python3.7/dist-packages (2.9.2)

Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (14.0.6)

Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.1.0)

Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.27.0)

Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from tensorflow) (21.3)

Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.6.3)

Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.2.0)

Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.15.0)

Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.50.0)

Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-packages (from tensorflow) (57.4.0)

Requirement already satisfied: keras-preprocessing>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.1.2)

Requirement already satisfied: gast<=0.4.0,>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (0.4.0)

Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.3.0)

Requirement already satisfied: tensorboard<2.10,>=2.9 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.1)

Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.21.6)

Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (4.1.1)

Requirement already satisfied: protobuf<3.20,>=3.9.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.19.6)

Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (3.3.0)

Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.1.0)

Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.14.1)

Requirement already satisfied: tensorflow-estimator<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)

Requirement already satisfied: keras<2.10.0,>=2.9.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (2.9.0)

Requirement already satisfied: flatbuffers<2,>=1.12 in /usr/local/lib/python3.7/dist-packages (from tensorflow) (1.12)

Requirement already satisfied: wheel<1.0,>=0.23.0 in /usr/local/lib/python3.7/dist-packages (from astunparse>=1.6.0->tensorflow) (0.38.3)

Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-packages (from h5py>=2.9.0->tensorflow) (1.5.2)

Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (3.4.1)

Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (1.0.1)

Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (0.6.1)

Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (2.23.0)

Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (1.8.1)

Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (0.4.6)

Requirement already satisfied: google-auth<3,>=1.6.3 in /usr/local/lib/python3.7/dist-packages (from tensorboard<2.10,>=2.9->tensorflow) (2.14.1)

Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (4.9)

Requirement already satisfied: cachetools<6.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (5.2.0)

Requirement already satisfied: pyasn1-modules>=0.2.1 in /usr/local/lib/python3.7/dist-packages (from google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (0.2.8)

Requirement already satisfied: requests-oauthlib>=0.7.0 in /usr/local/lib/python3.7/dist-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.10,>=2.9->tensorflow) (1.3.1)

Requirement already satisfied: importlib-metadata>=4.4 in /usr/local/lib/python3.7/dist-packages (from markdown>=2.6.8->tensorboard<2.10,>=2.9->tensorflow) (4.13.0)

Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from importlib-metadata>=4.4->markdown>=2.6.8->tensorboard<2.10,>=2.9->tensorflow) (3.10.0)

Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/dist-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<2.10,>=2.9->tensorflow) (0.4.8)

Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (3.0.4)

Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (2.10)

Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (1.24.3)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.10,>=2.9->tensorflow) (2022.9.24)

Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.10,>=2.9->tensorflow) (3.2.2)

Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/python3.7/dist-packages (from packaging->tensorflow) (3.0.9)

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)

Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python) (1.21.6)

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: opencv-contrib-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)

Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-contrib-python) (1.21.6)

In [2]:

pip install opencv**-**python

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)

Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python) (1.21.6)

In [3]:

**import**tensorflow**as**tf

**import**numpy**as** np

**from**tensorflow**import**keras

**import**os

**from**tensorflow.keras.preprocessing.image**import**ImageDataGenerator

**from**tensorflow.keras.preprocessing**import** image

In [4]:

train**=**ImageDataGenerator(rescale**=**1.**/**255,

shear\_range**=**0.2,

rotation\_range**=**180,

zoom\_range**=**0.2,

horizontal\_flip**=True**)

train **=**ImageDataGenerator(rescale**=**1**/**255)

test **=**ImageDataGenerator(rescale**=**1**/**255)

In [5]:

train\_dataset**=**train**.**flow\_from\_directory("/content/drive/MyDrive/IBM/final deliverables/Dataset/Dataset/Testing",

target\_size**=**(128,128),

batch\_size**=** 32,

class\_mode**=** 'binary' )

Found 380 images belonging to 2 classes.

In [6]:

test\_dataset**=**test**.**flow\_from\_directory("/content/drive/MyDrive/IBM/final deliverables/Dataset/Dataset/train\_set",

target\_size**=**(128,128),

batch\_size**=** 32,

class\_mode**=** 'binary' )

Found 1520 images belonging to 2 classes.

In [7]:

test\_dataset**.**class\_indices

Out[7]:

{'fire': 0, 'nofire': 1}

In [8]:

*#to define linear initialisation import sequential*

**from**keras.models**import** Sequential

*#to add layer import Dense*

**from**keras.layers**import** Dense

*#to create convolution kernel import convolution2D*

**from**keras.layers**import** Convolution2D

*#importMaxpooling layer*

**from**keras.layers**import** MaxPooling2D

*#import flatten layer*

**from**keras.layers**import** Flatten

**import** warnings

warnings**.**filterwarnings('ignore')

In [9]:

model **=**keras**.**Sequential()

model**.**add(Convolution2D(32,(3,3),input\_shape**=**(128,128,3),activation**=**'relu'))

model**.**add(MaxPooling2D(pool\_size**=**(2,2)))

model**.**add(Convolution2D(32,(3,3),activation**=**'relu'))

model**.**add(MaxPooling2D(pool\_size**=**(2,2)))

model**.**add(Convolution2D(32,(3,3),activation**=**'relu'))

model**.**add(MaxPooling2D(pool\_size**=**(2,2)))

model**.**add(Convolution2D(32,(3,3),activation**=**'relu'))

model**.**add(MaxPooling2D(pool\_size**=**(2,2)))

model**.**add(Flatten())

In [10]:

model**.**add(Dense(150,activation**=**'relu'))

model**.**add(Dense(1,activation**=**'sigmoid'))

In [11]:

model**.**compile(loss **=** 'binary\_crossentropy',

optimizer **=** "adam",

metrics **=** ["accuracy"])

In [12]:

r **=**model**.**fit(train\_dataset, epochs **=** 5, validation\_data**=**test\_dataset)

Epoch 1/5

12/12 [==============================] - 724s 66s/step - loss: 0.5401 - accuracy: 0.7868 - val\_loss: 0.3640 - val\_accuracy: 0.8329

Epoch 2/5

12/12 [==============================] - 19s 2s/step - loss: 0.3495 - accuracy: 0.8684 - val\_loss: 0.2594 - val\_accuracy: 0.9171

Epoch 3/5

12/12 [==============================] - 20s 2s/step - loss: 0.2189 - accuracy: 0.9237 - val\_loss: 0.1627 - val\_accuracy: 0.9454

Epoch 4/5

12/12 [==============================] - 19s 2s/step - loss: 0.1603 - accuracy: 0.9526 - val\_loss: 0.1404 - val\_accuracy: 0.9520

Epoch 5/5

12/12 [==============================] - 21s 2s/step - loss: 0.1412 - accuracy: 0.9421 - val\_loss: 0.1792 - val\_accuracy: 0.9257

In [13]:

predictions **=**model**.**predict(test\_dataset)

predictions **=**np**.**round(predictions)

48/48 [==============================] - 12s 239ms/step

In [14]:

print(len(predictions))

1520

In [15]:

model**.**save("/content/forest1.h5")

In [16]:

*#import load\_model from keras.model*

**from**keras.models**import**load\_model

*#import image class from keras*

**import**tensorflow**as**tf

**from**tensorflow.keras.preprocessing**import** image

*#importnumpy*

**import**numpy**as** np

*#import cv2*

**import** cv2

In [17]:

model **=**load\_model("/content/forest1.h5")

In [18]:

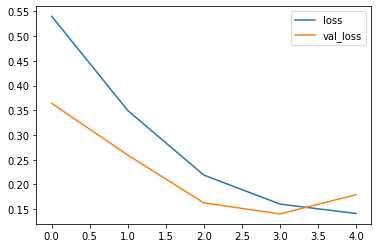
**import**matplotlib.pyplot**as**plt

plt**.**plot(r**.**history['loss'],label**=**'loss')

plt**.**plot(r**.**history['val\_loss'],label**=**'val\_loss')

plt**.**legend()

Out[18]:

****

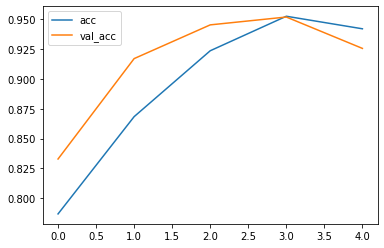
In [19]:

plt**.**plot(r**.**history['accuracy'],label**=**'acc')

plt**.**plot(r**.**history['val\_accuracy'],label**=**'val\_acc')

plt**.**legend()

Out[19]:

****

In [22]:

**def**predictImage(filename):

img1**=**image**.**load\_img(filename,target\_size**=**(128,128))

plt**.**imshow(img1)

y**=**image**.**img\_to\_array(img1)

x**=**np**.**expand\_dims(y,axis**=**0)

val**=**model**.**predict(x)

print(val)

**if**val**==**0:

plt**.**xlabel("fire",fontsize**=**30)

**elif**val**==**1:

plt**.**xlabel("NO fire",fontsize**=**30)

In [23]:

predictImage("/content/drive/MyDrive/IBM/final deliverables/Dataset/Dataset/Testing/fire/fire\_0027.jpg")

1/1 [==============================] - 0s 25ms/step

[[0.]]

****

In [24]:

predictImage("/content/drive/MyDrive/IBM/final deliverables/Dataset/Dataset/Testing/nofire/nofire\_0012.jpg")

1/1 [==============================] - 0s 23ms/step

[[1.]]

****

In [25]:

pip install twilio

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Collecting twilio

Downloading twilio-7.15.2-py2.py3-none-any.whl (1.4 MB)

|████████████████████████████████| 1.4 MB 7.2 MB/s

Requirement already satisfied: requests>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from twilio) (2.23.0)

Collecting PyJWT<3.0.0,>=2.0.0

Downloading PyJWT-2.6.0-py3-none-any.whl (20 kB)

Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages (from twilio) (2022.6)

Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2022.9.24)

Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (3.0.4)

Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (2.10)

Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests>=2.0.0->twilio) (1.24.3)

Installing collected packages: PyJWT, twilio

Successfully installed PyJWT-2.6.0 twilio-7.15.2

In [26]:

pip install playsound

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Collecting playsound

Downloading playsound-1.3.0.tar.gz (7.7 kB)

Building wheels for collected packages: playsound

Building wheel for playsound (setup.py) ... done

Created wheel for playsound: filename=playsound-1.3.0-py3-none-any.whl size=7035 sha256=3ce1637bf056fee9315ff557393641273f3793c244c71dc4313230f5044f055e

Stored in directory: /root/.cache/pip/wheels/ba/f8/bb/ea57c0146b664dca3a0ada4199b0ecb5f9dfcb7b7e22b65ba2

Successfully built playsound

Installing collected packages: playsound

Successfully installed playsound-1.3.0

In [27]:

pip install opencv**-**python

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/

Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (4.6.0.66)

Requirement already satisfied: numpy>=1.14.5 in /usr/local/lib/python3.7/dist-packages (from opencv-python) (1.21.6)

In [28]:

*#importopencvlibrariy*

**import** cv2

*#importnumpy*

**import**numpy**as** np

*#import image function from keras*

**from**keras.preprocessing**import** image

*#importload\_model from keras*

**from**keras.models**import**load\_model

*#import client from twilio API*

**from**twilio.rest**import** Client

*#imortplaysound package*

**from**playsound**import**playsound

WARNING:playsound:playsound is relying on another python subprocess. Please use `pip install pygobject` if you want playsound to run more efficiently.

In [31]:

*#load the saved model*

model **=**load\_model(r'/content/forest1.h5')

*#define video*

video **=** cv2**.**VideoCapture('/content/drive/MyDrive/forest fire.mp4')

*#define the features*

name **=** ['forest','with forest']

In [32]:

video**.**isOpened()

Out[32]:

True

In [33]:

**from**tensorflow.keras.preprocessing**import** image

In [34]:

**from**IPython.display**import** Audio

In [ ]:

**while**(video**.**isOpened()):

success,frame**=**video**.**read()

cv2**.**imwrite("image.jpg",frame)

img**=**image**.**load\_img("/content/image.jpg",target\_size**=**(128,128))

x**=**image**.**img\_to\_array(img)

x**=**np**.**expand\_dims(x,axis**=**0)

pred**=**model**.**predict(x)

p**=**pred[0]

print(pred)

cv2**.**putText(frame,"predicted class = ",(100,100),cv2**.**FONT\_HERSHEY\_SIMPLEX, 1, (0,0,0), 1)

**if**pred[0]**==**1:

account\_sid**=**'AC1a92521871480f58548ab47433527298'

auth\_token**=**'596097e117fb2295a39c05a192353001'

client**=**Client(account\_sid,auth\_token)

message**=**client**.**messages \

**.**create(

body**=**"Forest fire is detected ,stay alert",

from\_**=**'+14258421887',

to**=**'+919150947787')

print(message**.**sid)

print('Fire detected')

print('SMS sent')

wn**=**Audio('/content/tornado-siren.mp3',autoplay**=True**)

display(wn)

**break**

**else**:

print('No danger')

**break**

**if** cv2**.**waitKey(1) **&** 0xFF**==**ord('a'):

**break**

video**.**release()

cv2**.**destroyAllWindows()